hence the driving wheels, which nevertheless can move independently. Other gears were spoken of, and a figure of the Sparkbrook gear given.

Each kind of driving has its advantages. When running straight the clutch system drives each wheel, and when one wheel meets with more resistance than the other, as much extra force as is necessary is supplied to it, so that obstacles are surmounted with less chance of swerving. In going round a corner only the inner wheel is driven.

With balance-gear the same force is applied to each wheel, whether the path is straight or curved.

A rear steering tricycle driven by clutch action, a rear steerer driven by differential gear, and a front steerer driven by differential gear were exhibited.

Humber Tricycle.—Among tricycles driven by differential gear, the Humber is quite peculiar. The rider sits astride a back bone carrying a trailing wheel, and steers by turning the axle of the two driving wheels by means of a handle bar. The differential gear is essential to a machine of this type, as it does not interfere with the steering, while it is at all times perfectly double driving.

A curious machine—a modification of the Humber—was shown, in which all three wheels take part in the steering, but of entirely novel and elegant design.

As with bicycles, so with tricycles, the power may be applied in one of two ways: either by rotary action or by lever action. For changing the power, levers are more convenient, but they do not compare with rotary action in point of speed.

Omnicycle.—One of the most successful lever machines is the omnicycle, a machine in which the pedals are connected with the circumference of a segment by means of a leather strap. When one pedal descends it causes the segment on the other side to return and raise the pedal on that side. The segments can be expanded to various extents, so that the power is applied with various degrees of leverage according to the work to be done.

Direct-Action Tricycle.—The simplest rotary tricycle has no chain or connecting mechanism; the pedals are on the main axle, which is cranked. This gives rise to the insuperable objection of instability as the rider is necessarily perched up high. By the use of hanging pedals a few inches are gained.

Transmission of Driving-power.—Reverting to the ordinary type of tricycle in which the power is applied to a crank axle and transmitted thence to the main axle, there are three plans commonly in use—(1) by chains or bands: (2) by gear wheels; (3) by cranks and coupling-rods.

Driving-Chains. These are the most popular means of transmitting power, as they offer the greatest facilities for gearing up or down. The Morgan and the Abingdon chain were figured and described.

Driving-Bands.—Steel bands, plain or perforated, have been used with some success. The Otto bicycle is the only machine in which plain bands are used for driving. The power spent in continuous flexure of the bands outweighs, in the author's opinion, any other advantages they may possess.

Gear-Wheels.—In this system an intermediate wheel gears with those on each axle; but as the wear cannot be taken up without destroying the pitch, the plan is hardly satisfactory. Rollers are occasionally fitted over the teeth of the intermediate wheel.

Coupling-Rods.—Coupling-rods are used on a few machines; with the exception that they will not permit of gearing up or down and that they cannot be used with differential gear, they give very good results.

Another method due to Mr. Boys, in which eccentrics and steel bands are employed, was also referred to.

(*To be continued.*)

NOTES

DR. ASA GRAY was presented, on November 18, being the seventy-fifth anniversary of his birth, with a silver vase, by the botanists of America. It is described by *Science* as being about eleven inches high, and is appropriately decorated with those plants which are distinctively American, and which are most closely associated with Dr. Gray. The place of honour on one side is held by *Grayia polygaloides*, and on the other by *Shortia galacifolia*. Among others, *Aster Bigelovii*, *Solidago serotina*, *Lilium Grayi*, *Centaurea americana*, *Notholæna Grayi*, and *Rudbeckia speciosa*, are prominent. The workmanship is described as highly artistic, as well as remarkably accurate. The vase stands on a low ebony pedestal, which is surrounded by a silver hoop, bearing the inscription:—

1810—November Eighteenth—1885
ASA GRAY
In token of the universal esteem
of American botanists.

The greetings by card and letter of the one hundred and eighty contributors were presented on a plain but elegant silver tray. They contained the warmest expressions of esteem and gratitude.

AS we intimated last week, the death took place in Paris, on the 30th ult., of M. Bouley, President of the Academy of Sciences, after a long and painful illness. Although, says the *Revue Scientifique*, he did little original work in science, he exercised a wide influence on its general progress as well as on scientific education. He did much to raise in public consideration the art and science of veterinary surgery and medicine. Latterly, he became the ardent apostle of the teachings and discoveries of M. Pasteur, and to this work he devoted his lucid and vigorous eloquence. His books on experimental disease and on contagion are models of scientific style, as his lectures at the Museum were models of instruction.

THE death is announced, at the age of eighty years, of Prof. Giuseppe Ponzi, the Italian geologist.

THE fifth edition of the "Admiralty Manual of Scientific Inquiry" is now being prepared for press, under the editorship of Prof. Robert S. Ball, F.R.S., Royal Astronomer of Ireland The following is a list of the articles, with the names of the authors or revisers:—Astronomy, by Sir G. B. Airy, K.C.B., F.R.S.; Hydrography, by Capt. W. J. L. Wharton, R.N., Hydrographer of the Admiralty; Tides, by Prof. G. H. Darwin, F.R.S.,; Terrestrial Magnetism, by Prof. G. F. Fitzgerald, F.R.S.; Meteorology, by Robert H. Scott, F.R.S.; Geography, by Sir J. H. Lefroy, F.R.S.; Statistics, by Prof. C. F. Bastable, M.A.; Medical Statistics, by W. Aitken, M.D.; Ethnology, by E. B. Tylor, F.R.S.; Geology, by Prof. Archibald Geikie, F.R.S.; Mineralogy, by Prof. W. J. Sollas, D.Sc.; Earthquakes, by Thomas Gray; Zoology, by Prof. H. N. Moseley, F.R.S.; Botany, by Sir J. D. Hooker, K.C.S.I., F.R.S.

NOW that M. de Lacase-Duthiers has completed his arrangements for the marine laboratories at Banyuls and Roscoff, his friends and admirers have deemed the moment a suitable one for manifesting their sense of the value of his services to the study of zoology in France, and to zoologists all over the world, and it is hoped that all those who are connected, either by their studies or their sympathies, with the zoological school founded and directed by him, will join in the work. The proposal is to have his portrait etched by one of the best French artists, and to give a copy to each subscriber of ten francs or more. The number of copies will be strictly limited to the number of subscribers. The Universities or schools of Athens, Paris, Caen, Geneva, Liége, Cairo, Edinburgh, Clermont, Besançon, Lyons,

and Poitiers are represented on the Committee. Subscriptions may be sent, before December 16, to M. J. Joyeux-Laffuie, of the Faculty of Sciences, Besançon, or, in this country, to Prof. Geddes, 81A, Princes Street, Edinburgh.

THE new balloon constructed by the Meudon aëronauts, will be directed by a steam-engine, as advocated by M. Henry Giffard. Electricity will be quite given up, owing to its want of power for continuous action. From the reports to be published in the next number of the *Comptes rendus*, it appears that a velocity of six metres per second was obtained.

THE Tokio Correspondent of the *Times* describes a strange linguistic revolution which is coming over Japan. Hitherto the Japanese language has been written by Chinese ideographs, or pictorial symbols, of which many thousands had to be learned by every youth. There were also two syllabaries or alphabets which were used by the common people, but no one could enter on the path of knowledge without first acquiring a knowledge of the Chinese characters, "a task which not only needed a very heavy expenditure of time, but was also calculated to stimulate the memory in an abnormal degree at the cost of other not less important mental faculties." Moreover, with the new science from the west before them, Japanese youth "could hardly afford to spend years and warp their brains in learning the single accomplishment of writing thoroughly their own tongue." A movement, which appears to be as national as such a movement could be, has now been set on foot to discard all existing methods of writing Japanese in favour of Roman letters. A society called the Roman Alphabet Association has been founded for the purpose of disseminating knowledge on this subject and of providing a uniform method of transliteration. It now consists of nearly 6000 of the leading men in the governing, educated, and literary classes. Stupendous as this change may seem to us, there is really no reason why it should not successfully be carried out. It meets in Japan a crying evil, which stunts the mental growth of its youth, places a barrier between them and the science and discoveries of the age, and which haunts and embarrasses them in their subsequent studies unless they acquire a foreign language at once in order to get rid of this incubus. Besides, the Japanese language is now written in borrowed symbols; Chinese characters are as alien to it as Roman letters; but the former have been in use a thousand years, and if the Japanese can now succeed in getting rid of them they will have accomplished a revolution more marvellous and not less beneficent than any they have passed through in the last seventeen years.

WE have received from Mr. Twining a pamphlet, of which he is the author, on "Science for the Middle and Upper Classes," which is intended for the consideration of those interested in educational progress (London: J. J. Griffin and Sons, 22, Garrick Street). He first deals with the chief purposes of scientific instruction, which he classes under the heads "bionomic" ("bionomy" being his convenient expression for the science of daily life) "intellectual," "technical," and "professorial." He then draws up and discusses a scheme of scientific teaching extending over the whole school period of a boy. There are, in addition, numerous observations on the teaching f various branches of science. Mr. Twining's pamphlet is herefore essentially for the teacher, and, as he has evidently devoted great attention to the subject, and is himself engaged in the practical work of education, his pamphlet should prove useful and suggestive.

IN the *Revue Scientifique* M. de Lacaze-Duthiers describes a curious phenomenon which he has observed in a parrot belonging to him. The bird is very intelligent, having an excellent memory for his friends and his enemies; of this trait and other marks of intelligence the writer gives several instances. The point of the article, however, is this:—The parrot has manifested an extraordinary affection for a little boy named Raymond, but usually called by the Southern diminutive, "Momon." The child called M. Duthiers's attention one day to the fact that, whenever he played with the bird, the eyes of the latter became quite red. When the boy went away, the parrot would call out his name perpetually; when he returned, it would walk to and fro on its perch, exhibiting every mark of extreme pleasure; and the eyes invariably grew red. At these times it would allow no one else, however friendly, to approach the cage; it would not eat its most favourite food. When the boy hid himself for a moment, the eyes became yellow, but suddenly reddened again when he reappeared. This phenomenon was observed only with this particular child, and with no one else. When the boy went to school, or when the bird was brought to Paris from the country, it ceased completely. An examination of the bird's eye showed that the pupil is large, and usually dilated. The iris is only represented by a circular yellow band, bordered externally by a bright red strip. The pupils of parrots are known to be very mobile. When the bird manifests joy, it contracts the iris *voluntarily*, the yellow disappears, and the red strip occupies its place, spreading itself out all over the surface of the back of the anterior chamber of the eye, giving the striking red tint observed first by the child. Here, then, is a bird, intelligent, and full of affection for a particular person, manifesting its joy by the contraction of its pupils, and thus voluntarily modifying the colour of its eyes. When violently angry, some streaks of red dart across the eye, but they never remain as in the other case. It is curious, concludes M. Duthiers, to see a phenomenon, regarded as independent of the will in the superior animals, thus found in association with feelings and acts which determine joy or anger, and which is apparently as voluntary as the movements of the feathers and all other essentially voluntary acts.

HERR STEJNEGER continues to supply *Naturen* with interesting reports of his recent boating expeditions in Behring's Sea. In the latest of these we find much valuable information in regard to important changes to which the fauna of these regions is being subjected through the reckless destruction of some animals, and the rapid spread of others by the introduction, through the agency of man, of previously unknown species. Thus, while there were upwards of 5000 sea-otters (*Latax lutris*) killed on the Prybilof Islands in the first year of their occupation, after six years not one of these animals was to be found on the spot, nor have they ever reappeared there during the century that has elapsed since then. At Mednij, on the other hand, where otter-hunting is conducted with moderation and under legal restrictions, there is no marked diminution in the numbers of these animals, and there is at present every prospect that the supply of skins will continue to yield a fair source of wealth to the inhabitants. The killing of foxes is similarly controlled in some districts, where the natives refuse to allow Master Reynard to be hunted, excepting in the last three months of every second year, during which time no one is allowed to fire a gun, or drive with dogs along the coast, lest the sound of the shots and the barking should interfere with the success of the licensed fox-hunters, who on these occasions occupy the earth huts specially set apart for their use in the several districts.

OWING to the moderation shown in its pursuit, the Behring Straits fox, known as the blue fox, from the colour of its skin in winter, seems for the present to be in no danger of dying out, several of these animals being generally visible on the strand of every little bay, where they arrest attention by their loud, howling bark, which is often continued hour after hour through the night. Till recently they might have been regarded as the only terrestrial quadrupeds on Behring's Island; but in the present day the brown field-mouse (*Arvicola rutila*), which was unknown eleven years ago, has made good its footing on the

island, swarming over every district, from the heights of the fjelds to the flats of the tundra, and from the interior to the most exposed rocks along the coasts. Till 1874 the mouse family was unknown on the island, the oldest inhabitants never having seen one of the species prior to that date, when the gray mouse (*Mus musculus*) unexpectedly made its appearance, having probably been introduced in a cargo of flour from San Francisco. The advent of these pests was followed a few years later by that of the more destructive brown field-mouse, a phenomenon which the simple natives explain to their own satisfaction by assuming that the shorter-tailed rodent is a descendant of the long-tailed gray mouse, which had thus changed its colour and appearance the better to adapt itself to its novel terrestrial life. Mednij is still free from these undesirable immigrants, but the fact is not regarded in the light of a happy exemption by the inhabitants, who, considering this short-tailed little quadruped as specially adapted for a domestic pet, petitioned the authorities to provide them with an adequate supply. Their eager desire for the acquisition of rodents has, fortunately for them, been only so far complied with that, in place of the coveted voles, a few rabbits were sent to the island.

Naturen draws attention to the notices to be found among Scandinavian authorities of the observation in past times of the same after-glow in the sky which has in recent years been made the subject of so much discussion. Thus we learn from a Danish journal that the glow in the skies observed in 1636 by seamen navigating the northern seas was ascribed at the time to the eruption of Hecla which occurred in that year. From the same source we derive a circumstantial notice of a similar phenomenon observed in Copenhagen on May 29, 1783, which continued, with slight variations, till the close of the following September. In the months intervening between these dates the heavens were illumined by a constant red glow, although the sun appeared by day like a faint disk, and was wholly invisible at its rising and setting. The air is said to have remained unaffected by cold or heat, rain, or dry weather. The superstitious were not slow in interpreting these unwonted phenomena to portend great national troubles, while some persons even regarded them as the immediate forerunners of the end of the world. After a time, however, news reached Denmark that there had been an unusually violent eruption of the Skapta Jökul in the previous spring, and thenceforth a conjecture was advanced that the remarkable redness of the sky might, as in 1636, be connected with the great outbreak of volcanic energy in Iceland.

A NEW discovery of apatite is reported from Stavanger, where, about 30 kilometres east-south-east of the spot at which Herr Enoksen found this mineral last summer, its presence has again been detected in a granitic formation near Lerwik. Here it appears in a finely granulated form intermixed with nickel and magnetic iron pyrites, the masses varying in size from 18 to 38 inches in diameter, and lying detached in a dark deposit, which is believed to be mica diorite. In the matter of mineral finds of real value the Stavanger district has been specially favoured in recent times, and we are glad to learn that the sanguine expectations excited by the accidental discovery in 1881 of a zinc mine near the head of the Sövdefjord, have been fully justified by the result of the yields. On a more careful examination it has been ascertained that these mineral deposits extend horizontally for a distance of 80 metres, while they have been traced to a depth of 60 metres. The ore is blende, or sulphide of zinc, which appears in flat perpendicular masses, from 50 centimetres to 4 metres in thickness.

THE Russian Government has assigned the sum of 255,500 roubles to be expended during the year 1886 in new geodetical surveys in Ferghana, the territories bordering on China, the Usuri district, the Transcaspian province, and Finland.

THE Government of Tasmania are making arrangements upon a large scale for naturalising lobsters, crabs, turbot, brill, and other European fishes in the waters of that country. The various consignments will be shipped at Plymouth, and transported through the medium of the steamship companies trading between London and Hobart. An exhaustive report has been published by the Government of Tasmania, setting forth the objects in view, and giving suggestions for carrying them into effect. The report adds that while the achievement of the acclimatisation of European fishes would lay the foundation of new and very valuable fishing industries in Tasmania, it might also prove a highly remunerative commercial enterprise to the shipping firms under whose auspices the operations wil be conducted. Applications have been made in various quarterl for supplies of fish, which have been satisfactorily responded to. Special tanks are being prepared, as well as apparatus, in order to provide for the necessities of the fish *en route* which, it is anticipated, can be transmitted with little difficulty. The success that has hitherto attended the acclimatisation of certain European fishes in New Zealand has had the effect of inspiring the Government of that colony with considerable enterprise in developing their fisheries. They are now about to collect the ova of *Salmonidæ* from English waters in large numbers through the instrumentality of the National Fish-Culture Association, and other bodies, with a view to rearing the fry in New Zealand. A shipment of eggs will also shortly be sent to Australia, where great success has attended the introduction of our fishes, except in a few instances, when failure resulted more from misadventure than from the impracticability of the attempt.

A DREADFUL earthquakc occurred in Algeria on the night of December 3–4. The centre of commotion seems to have been located near M'sila, a small town in the interior. The place was disturbed a second time on the following morning. The last commotion was more destructive than the first. The number of victims is estimated at one hundred. The commotion was felt at Setif and at Moscara, whose distance is about 400 kilometres. Their direction was east to west. The difference was 7 seconds at Setif, and 8½ at Moscara, where three different shocks were felt. The commotion was noted also in Algiers without any accident being recorded. According to latest news, the series of earthquakes is continuing with unabated energy. We learn that on the night of the 4th to the 5th inst. a port of Bousaada, a town of 6000 inhabitants, almost exclusively Arabs, has been partially destroyed. The church and seventy-one houses have been demolished; the victims are not numerous, all the population having encamped in the fields. This town is the centre of a large market, celebrated in all the south of the province of Algiers, 254 kilometres south of the city. Another telegram states that other commotions were felt on the 6th at M'sila for the second time. These last shocks are reported very heavy; time, 2 and 4 p.m. The time appears to have been the same at M'sila.

OUR Paris correspondent writes that in relation to the balloon which is said to have been seen over Bermuda in September, no ascent took place in France which can account for it.

WE learn with regret that M. de Mortillet, the sub-Director of the Prehistoric Museum at St. Germain, has been obliged to resign owing to his election to the French Lower House as a Member for Versailles. A competition has been opened to fill up the post vacated by his resignation. The Society of Anthropology and similar scientific institutions have signed a recommendation to the Minister of Public Instruction on behalf of M. Adrien de Mortillet, who has been associated with his father in the publication of his recent works on prehistoric science.

THE additions to the Zoological Society's Gardens during the past week include a Sly Silurus (*Silurus glanis*), European, a Thunder-fish (*Misgurnus fossilis*), a Ground Loach (*Cobitis tænia*) from Danzig; a Barbel (*Barbus vulgaris*), a River Bull-head (*Cottus gobio*) from British fresh waters, presented by Mr. Alban Doran, F.R.C.S.; one hundred Golden Carp (*Carassius auratus*) from Spain, presented by Messrs. Paul and Co.; a Black-shouldered Kite (*Elanus cæruleus*) from Africa, received in exchange.

ASTRONOMICAL PHENOMENA FOR THE WEEK, 1885, DECEMBER 13-19

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on December 13

Sun rises, 8h. 0m.; souths, 11h. 54m. 33·8s.; sets, 15h. 49m.; decl. on meridian, 23° 12′ S.: Sidereal Time at Sunset, 21h. 19m.

Moon (at First Quarter on Dec. 14) rises, 11h. 48m.; souths, 17h. 16m.; sets, 22h. 53m.; decl. on meridian, 6° 51′ S.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
Mercury	8 53	12 48	16 43	23 8 S.
Venus	11 4	15 18	19 32	20 5 S.
Mars	23 0*	5 43	12 26	7 52 N.
Jupiter	0 45	6 47	12 49	0 23 S.
Saturn	16 49*	0 58	9 7	22 27 N.

* Indicates that the rising is that of the preceding day.

Occultations of Stars by the Moon

Dec.	Star	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
17	μ Piscium	5	1 47	2 40	159 308
18	B.A.C. 741	6½	3 9	3 23	66 34
18	B.A.C. 987	6½	23 2	0 2†	162 284

† Occurs on the following day.

Phenomena of Jupiter's Satellites

Dec.	h. m.		Dec.	h. m.	
13	7 14	I. tr. ing.	16	1 19	I. occ. reap.
14	3 24	I. ecl. disap.	17	7 2	II. ecl. disap.
14	6 51	I. occ. reap.	18	4 36	IV. ecl. disap.
15	1 43	I. tr. ing.	18	7 23	IV. ecl. reap.
15	2 29	III. occ. reap.	19	4 36	II. tr. ing.
15	3 59	I. tr. egr.	19	7 24	II. tr. egr.

The Occultations of Stars and Phenomena of Jupiter's Satellites are such as are visible at Greenwich.

Dec.	h.	
17	7	Mercury at least distance from the Sun.
19	4	Mercury in inferior conjunction with the Sun.

Variable Stars

Star	R.A. h. m. s.	Decl. ° ′		d.	h. m.	
R Vulpeculæ	20 59 17	23 22·0 N.	Dec.	15,		... *m*
δ Cephei	22 24 54	57 49·6 N.	,,	16,	4	... *M*
			,,	17,	18	... *m*
R Cassiopeiæ	23 52 34	50 44·9 N.	,,	15,		... *m*
U Cephei	0 52 8	81 15·3 N.	,,	14,	2 26	... *m*
			,,	19,	2 5	... *m*
T Monocerotis	6 19 1	7 8·9 N.	,,	17,	22	... *M*
ζ Geminorum	6 57 17	20 44·3 N.	,,	18,	17	... *m*
U Monocerotis	7 25 19	9 32·2 S.	,,	17,		... *M*
T Geminorum	7 42 24	24 1·2 N.	,,	17,		... *M*
W Virginis	13 20 6	2 46·9 S.	,,	18,	2	... *m*
δ Libræ	14 54 50	8 3·7 S.	,,	15,	19 31	... *m*
			,,	18,	3 22	... *m*
U Coronæ	15 13 30	32 4·1 N.	,,	19,	21 25	... *m*

M signifies maximum; *m* minimum.

Meteor Showers

A shower from the constellation of the Quadrant, radiant, R.A. 220°, Decl. 53° N., may be looked for throughout the week, after the moon has set.

A small shower with radiant in the constellation of the Lynx, R.A. 108°, Decl. 63° N., has been observed by Schmidt and Zezioli during this week of the year.

Stars with Remarkable Spectra

V Cygni R.A. 20h. 37m. 36s., Decl. 47° 43′·8 N., variable. Secchi's fourth type. The blue end is either wanting or extremely faint. The two dark bands usually seen in the orange in stars of this type seem absent, but the dark band in the yellow is very pronounced.

	R.A. h. m. s.	Decl. ° ′		
Birmm. 566	20 32 50	17 52·0 N.	Mag. 7·0	Three well-marked examples of the third type
Birmm. 569	20 40 13	17 40·5 N.	Mag. 6·8	
L.L. 40182	20 43 24	0 59·2 S.	Mag. 6·8	
ρ Persei	2 57 48	38 23·8 N.	Variable	Three typical representatives of the third class
α Orionis	5 48 58	7 22·9 N.	Variable	
π Aurigæ	5 51 24	45 55·5 N.	Mag. 4·8	

α Orionis and ρ Persei show many fine metallic lines beside the system of dark bands, shading off towards the red, which forms the characteristic of the third type of stellar spectrum. These brighter stars should be by all means examined with the fainter stars of the same type that the observer may become perfectly familiar with the characters and positions of the principal bands.

The *Dun Echt Circular*, No. 101, issued on December 5, from Lord Crawford's Observatory, says that the announcement has been received by Harvard College Observatory, from Dr. Lewis Swift, Director of the Warner Observatory, of the discovery of a comet by Barnard.

1885	Greenwich M.T. h. m.	R.A. h. m.	Decl. ° ′
Dec. 3	15 7.2	4 21·9	N. 4 45

Daily motion 35′ towards the north preceding.

The above message was forwarded by Prof. Krueger, of Kiel.

EXPLOSIONS IN COAL MINES[1]

II.

THE superficial observer, in noting the real progress made during the last few years in the facility and success with which the electric light has been utilised in a remarkable variety of directions, might have been pardonably led to the conclusion that there existed no very great difficulties in the way of at once presenting the miner with an electric light in almost as portable a form as a safety lamp—incomparably safer than the best of these—and capable of affording a much superior light for the entire duration of his longest working hours underground. A little inquiry into the subject demonstrated to the Royal Commission that such a conclusion would be at least very premature, and that, although the subject was one most worthy of patient pursuit, the attainment of really useful results was beset with formidable difficulties. It is one thing to announce in oracular fashion, as the *Times* did, in a leading article last June, "that collieries ought to be lighted in a way to dispense with safety lamps," and "that electricity is the one illuminating medium which can supply the light which miners want, without the flame which endangers them." It is quite another thing to apply the electric light with safety, even along main roadways, in mines in which fire-damp is prevalent. The writer of those lines would have been less confident in his assertions had he sought sufficient information to teach him that the fracture of a glow-lamp, or the rupture of a conducting wire in a mine, might be as much fraught with danger as the injury of a safety lamp or the lighting of a pipe. Had he, moreover, but learned by simple inquiry what progress had been made by patient workers (at the time he was inspired thus to write), towards setting aside those sources of danger and providing the miner with a portable and efficient self-contained lamp, he would certainly have hesitated to assert that "no proper zeal has been brought to bear upon the conquest of difficulties" in the application of electric lighting in mines, or to sneer at "the scientific brains, whom the public may encourage, though it cannot compel, to exert themselves as keenly for the

[1] Address of Sir Frederick Abel, Chairman of Council of the Society of Arts, delivered at the opening meeting, Nov. 18, 1885.—(Abstract by the Author.)

Continued from p. 112.